Claim 48: The applicant has added claim 48 to include a factor that is noted in the disclosure and raised by the examiner in the prior office action.

48. (new) A method of claim 34, wherein the working liquid is de-gassed prior to being put in a tension state.

The applicant respectfully submits the following response first to the comments of the examiner at the interview of September 25 2008 at which the entire draft Office action response was discussed, followed by a revised version of this Office action response.

In response to the examiner's request for clarification on how do we conclude that the observations from the experiment implies Thermo-nuclear Fusion.

Evidence for Thermonuclear Fusion in Bubble Nuclear Fusion Studies (Taleyarkhan et al.)
As indicated to the examiner in the interview of May 2007, in general, the fusion of deuterium(D)-deuterium(D) atoms is unequivocally established in the literature (Gross, 1984) to lead to one of two almost equally probable nuclear reactions. These are:

- The production of a 1.01 MeV tritium (T) nucleus and a 3.02 MeV proton.
- The production of a 0.82 MeV helium-3 (^{3}He) nucleus and a 2.45 MeV neutron.

For the thermonuclear bubble fusion system, the tell-tale signatures of the event involve the measurement of 2.45 MeV neutrons which must be time-correlated with the time of bubble implosion (i.e., when the conditions are compressed and hot and light flashes are generated), the generation of gamma photons commensurate with neutron interactions with structural atoms, together with the generation of T nuclei at rates that are similar in rate to that for neutron production. In acoustic inertial confinement bubble nuclear fusion experiments (Taleyarkhan et al., 2002, 2004, 2006), the evidence for D-D fusion includes the following key findings of fact:

1. A statistically significant (4 to 5 Standard Deviations) production of tritium nuclei [Science (2002) – Fig. 3; Phys.Rev.E (2004)-Fig.11];
2. A statististically significant (4 to 25 Standard Deviations) number of 2.45 MeV neutrons [Science(2002)-Fig.4; Phys.Rev.E (2004)-Fig.8; Phys.Rev.Ltr (2006)-Fig.4];
3. An approximately equal number of D-D neutrons and T nuclei produced during any given experiment [Science(2002); Phys.Rev.E (2004)];
4. The generation of D-D neutrons time correlated with sonoluminescence (SL) flashes during deuterated bubble cluster implosions [Science(2002)-Fig.5; Phys.Rev.E (2004)-Fig.7];
5. The subsequent (to neutron and SL) emission of statistically significant quantities of gamma rays due to D-D neutron capture in hydrogen and other atoms of surrounding structures and in the detector; the ratio of gammas to neutrons being about 0.05 to about 0.15, and the energy of the gamma rays being ~ 2 MeV as to be anticipated [Phys.Rev.E (2004)-Figs.9,10];
6. The attainment of null results (i.e., no neutron, gamma or tritium emissions) for corresponding control experiments under identical conditions but with the *only variation being change of the D atoms in test liquids to H atoms* [Science (2002), Phys.Rev.E (2004), Phys.Rev.Ltr (2006);

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7. The consistency of the experimentally-observed results of neutrons and tritium with theory which, after considering all key physical phenomena associated with growth and implosion dynamics, reveal and predict conditions required for thermonuclear fusion (i.e., 1000+ GPa compression pressures and ~ 10^8 K plasma states) to occur only under the conditions of successful experiments. The same theoretical framework predicts non-attainment of such conditions for non-ideal thermal hydraulic conditions, as well as for low-accommodation coefficient fluids such as heavy water for similar experiment conditions – an aspect which is consistent with experimental findings, [Phys. Fluids (2005)-Fig.13, Science (2002)-Fig. 6];
8. The verification and confirmation of the neutron and tritium emission data by unaffiliated groups [Nucl.Engr.Design (2005); NURETH-11 (2005); Trans.Amer.Soc.(2006); Int.Fus.EnergyMtg.(2006); Bugg Report (2006); Public Demonstration Testomonials (2006)];
9. The consistency of neutron emission spectra from 5 separate reports with validated nuclear infrastructure methodologies utilizing state-of-art Monte-Carlo 3-D nuclear particle transport simulation tools (MCNP5 and SCINFUL) developed under U.S. DoE sponsorship at Los Alamos National Laboratory and Oak Ridge National Laboratory – as evidenced in Nucl. Engr. Des.(2008) – Figs. 6, 7, 9, 11]; and,
10. Testimonials of successful demonstrations on two separate occasions to collection of industry, government and academic bodies [IDI testimonials, 2006)].

With regard to the issues raised by the examiner in the Office Action:

1. The examiner claims that the applicant has elected in his response of 7/12/05 Group II Process, Species G(D-T) reaction and Species 1 (acoustical wave source).

1.1. The applicant respectfully submits that the election was with traverse and with regard to the election of species G has noted for example in that response that claims 23 and 27 are readable on D-T reactions.

1.2. The applicant further submits that a D-D reaction envelopes the conditions for a D-T reaction and provides for the record art that establishes factual experimental underpinnings. (reference: "Gross., R. A., 1984 "Fusion Energy" John Wiley & Sons.) Therefore, the applicant submits that the D-T reactions will occur if conditions for D-D reactions are provided as indicated in the Response of 2008-5-21 as experimental evidence of this reaction phenomenon.

Therefore the applicant respectfully requests the examiner to: Firstly, allow the revised claim 47 – now a method claim in the elected Invention I, and now with support for the factual experimental underpinnings for the D-T reaction; and Secondly, allow the generic claim, considering that the reaction conditions of the invention provide the requirements for either or both of the D-T and D-D reactions.

2. The examiner claims that the following submissions lacked probity for enablement & utility because they were established after the filing date :

a) Findings (Fig. 7c) in the premier journal Physical Review E, Vol. 69, 036109-1 to 11, by Taleyarkhan et al., 2004 that demonstrates experimentally that D-D fusion neutrons of 2.45 MeV in energy as required for thermonuclear fusion are emitted in a time –correlated manner with the emission of sonoluminescence (SL) light flashes demonstrating that the fusion reactions are occurring under hot, compressed conditions for the method and apparatus of this present invention application.

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b) The theoretical foundation for supercompression-induced thermonuclear fusion for the experimental conditions of the method used for the current application. This theoretical foundation takes into account all relevant physics and chemistry of the condition. It has passed worldwide peer reviews and validated by experts as being on sound theoretical foundations and published in the prestigious journal Physics of Fluids (Nigmatulin et al., 2005). This theoretical foundation when applied specifically to the method of the present invention confirms thermonuclear conditions (see Fig. 13 of the paper by Nigmatulin et al., 2005 – Physics of Fluids, Vol.17, 107106, 2005) with temperatures and pressures reaching in the range of 10^8K, and 1000+ Mbar, respectively – convincingly thermonuclear fusion conditions.

c) Three independent replications of published sonofusion results (Nuclear Engineering and Design journal paper, Vol. 235, pp.1317-1324 by Xu et al., 2005; Archives of Trans. American Nuclear Society, Vol. 95, pp. 736-737, by Forringer et al., 2006; Le Tourneau University, Texas, Press Release, 2006; and the Bugg, W confirmation report dated June 9, 2006 to Purdue University of 2006) of the present invention. Proof of reproducibility and repeatability and confirmation of successful fusion signals attainment following the apparatus and operations of this 10/692,755 Application from published documents were reproduced for the examiner.

The applicant respectfully submits first that the probity of the invention is established in the IDS filed October 27, 2003 of results of the present invention with experimental evidence preceding the filing: "Evidence for Nuclear Emmissions during Acoustic Cavitation". R.P.Taleyarkhan et al. Science 8 March 2002, Volume 295 pp1868-1873.

Moreover, further support is provided in the paper on theoretical foundations "The Analysis of Bubble Implosion Dynamics" Supplement #2 (Reference 25 in the above IDS) and as published in Science: www.Sciencemag.org/cgi/content/full/295/5561/1868/DC1.

The *additional* materials noted by the examiner were discussed with the examiner at the interview on May 21, 2007 to provide *additional* irrefutable evidence of the validity of the results of the present invention.

Item 2.a) is an experimental study reported in a reputable peer reviewed Journal that *further* supports enablement of the method and apparatus of the present invention for producing 2.45MeV neutrons required for nuclear fusion, in a correlated manner to the emission of sonoluminescense light flashes. The approach uses the *identical apparatus as noted in the invention* with the *exception of more sophisticated neutron detection approaches to get an even better statistically significant result*. Nothing in the observable ambient universe that could affect this experiment is known to have changed between the date of filing and this duplicate experiment, and therefore the results provide *additional* clear probity for the invention.

Item 2.b) is a theoretical foundation for supercompression-induced thermonuclear fusion for the experimental method and apparatus of the present invention. Published in a peer reviewed Journal. This theoretical result that *further* supports the results of the invention *by design* addresses the methods and apparatus of the present invention. Therefore it provides *additional* clear probity for the present invention.

Item 2.c) consists of three successful replications of the invention as filed. These replications used the same methods and design of apparatus of the present invention. The applicant in addition submits herewith affidavits under 37CFR 132 in support thereof.

Nothing in the observable ambient universe is known to have changed with regard to the present invention between the filing date of the invention and the dates of these experimental results.

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Therefore these three successful replication results provide *three more additional* references for clear probity for the present invention.

The applicant respectfully submits that the probity of enablement has been established with the filed IDS and in addition the evidence as above reported in reputable peer reviewed journals and the integrity of three separate replications with Affidavits provided under 37CFR132.

Furthermore, the applicant submits as attached, herewith yet another *additional* confirmation for the validity of the thermo-nuclear fusion results " Modeling Analysis and prediction of neutron emission spectra from acoustic cavitation bubble fusion experiments" Nuclear Engineering and Design 238 (20082779-2791) along with these affidavits.

3. The examiner rejects claim 34 as he states:

> Claim 34 recites the limitation, "placing at least a portion of said liquid into a tension state, a maximum tension in said tension state being below the cavitation threshold of said liquid." There is neither an adequate description nor enabling disclosure as to how and in what manner one can determine: a) that a portion of the liquid is in the so-called tension state; b) the maximum tension in a portion of the liquid in a tension state; and c) that the maximum tension is below the cavitation threshold of the liquid

The applicant respectfully submits that:

3.1. There exists a tension state for liquids achievable with tensile forces on the target volume of the liquids. For example even in nature mechanical motion of vascular passages of plants lead to liquid in tension. (Reference: Scholander., P. F., "Sap pressure in vascular plants" Science Volume 18, pp 339-345 16 April 1965.)

3.2. Therefore a portion of the liquid may be reduced to the tensioned state by applying a tensile force to the container walls that is by design in contact with the liquid. Such a force may be effected by a mechanical device as in the present invention that may be centrifugal force or oscillations of the wall by an electro-mechanical device. Such force enabling by these two phenomena are well established in the background art. The magnitude of the noted force can be increased by design to ensure that the liquid is at a desired level of the tension state.

3.3. The specification teaches the regions of the liquid that are in tension as a result of the apparatus design. For example originally filed Specification page 47 line 15-18 and Page 39 lines 19-21. (para [0135] and para [0167] as published).

3.4 There exists a cavitation threshold for such tensioned liquids by audible and visible inspection at adequate drive power of the mechanical force in the presence of nucleating particles.

3.5 The method or apparatus of the invention can achieve and exceed such a cavitation threshold *by design* as in 3.2 above, as a result of 3.3 above.

Therefore the applicant respectfully submits that the enablement requirement is met with the background art.

4. The examiner further states:

> Claim 34 further recites, "imploding said bubbles substantially filled with vapor." There is neither an adequate description nor enabling disclosure as to how and in what manner one: a) can determine when a bubble has been substantially filled with vapor; b)identify which of the bubbles that are allegedly substantially filled with vapor; and c) how many of these bubbles to implode to induce a nuclear fusion reaction.

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The applicant respectfully submits that:

4.1. The background Art is replete with exposition that any fluid will exert a vapor pressure in an adjoining space and therefore such bubbles are substantially filled with vapor of the parent liquid as disclosed. As there are no other liquids in contact with the bubble surface therefore there is no other vapor pressure exerted. Moreover, considering that there is no attempt to intentionally dissolve gases in the parent liquid the resulting partial pressures if any such gases are small, however as the parent liquid at some point may have had a surface open to a gas such as the constituent gases of the atmosphere, there is likely to be some – even minute quantities -- of preexisting dissolved gas in the parent fluid. Therefore the applicant submits that all such bubbles are substantially filled with vapor of the parent liquid.

4.2. One or more such imploding bubbles create nuclear fusion as substantiated in the experimental observation results of the disclosure. The nature of bubbles that create nuclear fusion are defined in the Specification Page 18 lines 20-21 page 19 lines 1-4.

Therefore the applicant respectfully submits that the disclosure in conjunction with the background art is enabling.

5. On claim 42, the examiner states:

> Claim 42 recites, "synchronizing neutron impact with a location in said liquid having a predetermined liquid tension level." There is neither an adequate description nor enabling disclosure as to how and in what manner one: a) can determine the occurrence of an impact of the neutron with the pre-tensioned liquid; b) synchronizes the neutron impact with a location in said liquid; c) determines which specific location to direct the impact of the neutron.

The applicant respectfully submits that the specification discloses the production of tensioning of the liquid in synchronization with the nucleating particles. Fig 3, Page 21 lines 8-15, Page 25 lines 3-20, of the original Specification.
The nucleating particles are directed in the direction of the chamber and therefore those that reach the liquid during the above tension state are capable of nucleating 10-100nm size bubbles. It is established in the background art that nucleating particles can nucleate bubbles of this size in meta-stable liquids. Reference: Glaser. D. A., Phys. Rev., Vol.87, 665, 1952.

Therefore the applicant respectfully submits that the disclosure in conjunction with the background art is enabling.

6. The examiner rejects claims 34-46 as he notes that on claim 34:

> In amended claim 34, applicant has deleted the step, "degassing said liquid to reduce a dissolved gas content therein, wherein said dissolved gas is removed using an applied vacuum." Note the following passages in the specification that demonstrate criticality of the degassing step in the exercise of the claimed invention:
>
> *"To minimize the effect of gas cushioning during implosive collapse, the working liquid can be degassed, a priori. Alternatively or in combination, a sufficient vacuum state above the working liquid accompanied by induction of gaseous cavitation induced by nuclear particles such as neutrons or via use of lasers or acoustic horns can be used to reduce the dissolved gas content in the working liquid to limit unwanted gas cushioning." See page* 17, last *paragraph.*

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> *Following degassing of the working liquid, the liquid is tensioned and nucleation of vapor cavities followed by implosion of the same can be initiated. Tensioning the liquid can be provided by a variety of methods, including an acoustical wave source, an electrostrictive (piezoelectric) source, a magnetostrictive source, a centrifugal source, a focused (pulsed) acoustic energy or a venturi based system. Preferably, when an acoustical wave source is used, the acoustical wave source includes an acoustical focusing device, such as a parabolic-type reflector or a resonant cavity to intensify the acoustic pressure. See page 17, last paragraph.*

The applicant respectfully submits that the degassing step is an *optional* step to enhance the operation of the method or apparatus even as stated in the above by the examiner:

> "To minimize the effect of gas cushioning during implosive collapse, the working liquid *can* be degassed, a priori." (emphasis provided)

The applicant therefore respectfully submits that the claim as amended is consistent with the original disclosure and requests the allowance of claims 34-46.

7. The examiner notes that Claim 44 recites the limitation "said fundamental particles" in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

The applicant agrees with the examiner and has amended claim 34 to be consistent.

8. The examiner notes in claim 46 that:

> The term "high accommodation coefficient liquid" in claim 46 is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The applicant respectfully submits that the specification makes clear what high and low mean. High accommodation coefficient is stated to be ~1.0 (the maximum) the value associated with organic liquids such as acetone, benzene, tetrachloroethylene whereas, low is stated to be closer to 0 citing the value for water at ~ 0.07 which is not recommended for enhanced fusion induction capability. See for example Specification as filed for experimental results page 16 lines 8-20 and validating theoretical foundations Page 70 lines 14-20, Page71 lines 1-8.

Moreover, the background art has definitions for high accommodation liquids accessible to those with ordinary skill in the art for example. Reference 25 in the IDS of 2003 .

35USC 102 Rejections

9. The examiner states in support of rejection of claims 34-40,42,44 and 45:

> Claims 34-40, 42, 44 and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by either one of Margulis (RU 2096934) or Lipson et al., "Initiation of fusion reactions in

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media containing deuterium by cavitation," Soviet Physics: Technical Physics 37 (1992) Marguulis.

In particularly with regard to claims 34, 35,37-40,42,44 and 45 the examiner states:

- As to claims 34, 35, 37-40, 44 and 45, Margulis discloses a method for generation of high-temperature plasma and generating thermonuclear reactions by providing a liquid enriched with a mixture of deuterium and tritium, creating tension microbubbles containing such mixture by ultrasonic vibrations and thereby generating thermonuclear reactions.

- Applicant has not defined which portion of the working liquid is placed in a maximum tension below the cavitation threshold. Absent such definition, the examiner interprets the term broadly and reads it on any and all portions of the working liquid.

- Accordingly, one can always find a portion of the liquid in Margulis that has such maximum tension below the cavitation threshold.

- As to the claimed "nucleating agents", the thermonuclear reactions in Margulis inherently produce at least neutrons and photons, and these are inherently directed to the tensioned liquid because said particles and said liquid are in the same contained volume of the apparatus.

- As to the bubbles being substantially filled with vapor, applicant has not defined the term substantially filled, and the examiner interprets this term broadly to read on any degree of filling that occupies most of the internal volume of a bubble.

- One can always find a plurality of bubbles in Margulis that is mostly filled with vapor because of the heat produced from the thermonuclear reaction .

- As to the growing of the bubbles and the temperature generated from the system, note page 6, last 2 lines in the English language translation of Margulis.

The applicant respectfully submits that there are fundamental differences between Margulis and the present invention as claimed in Claim 34 and its dependant claims:

9.1. Margulis requires a liquid under *positive pressure* for their reactions – it is a compressed liquid. Margulis *requires gas insertion* into the liquid for their process. Nowhere in Margulis is there reference to tensioned liquids. (Tensioned liquids have an absolute pressure of less than zero). In fact tensioned fluids cannot support the required seeding of D and/or T enriched and saturated gas bubbles together an inert gas, required for operation of Margulis. In contrast, the present invention requires a tension state as stated in claim 34, but no gas bubbles as required by Margulis.

9.2. Margulis is *enabled by the introduction of gas bubbles containing D and/or T atoms and an an inert gas* to saturate the parent fluid. The present invention *introduces the target D and/or T atoms by vaporizing the parent liquid*. There is no enablement requirement with gas bubbles in the present

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invention. Claim 34 and its dependants clearly state the working liquid to be enriched with D and/or T atoms and does not depend on any inserted gases.

9.3. Margulis with the gas saturated fluid cannot sustain a tension state. The background art is replete with examples of foaming of liquids saturated with gas as an inherent limitation for tensioning. For example consider the analogy of a gas saturated soda bottle that is opened to atmospheric pressure. Therefore the requirement of a tensioned liquid is not possible in Margulis. Therefore, *tension* micro-bubbles cannot be formed in Margulis. Therefore, for Margulis, even if nucleating particles are present, considering that a tension state is not attained, the conditions for these particles to initiate cavitation bubbles in a tension state in the liquid will clearly not be met.

9.4. If thermo-nuclear fusion occurs in Margulis, then neutrons produced will be when the gas bubbles are compressed therefore the liquid will be under positive pressure and not tension. Therefore there is no parallel between the present invention and Margulis on the nucleating agents.

9.5. If thermonuclear fusion occurs in Margulis, then it is true that there will be soon thereafter, rise in the temperature in the predominantly gas bubble. However, there is *no possibility* of the bubbles being substantially filled with vapor *before* such a thermonuclear fusion reaction occurs – if such a reaction were to occur in Margulis. The bubbles in Margulis are by design filled with a D and/or T enriched gas unrelated to the liquid.

The applicant submits therefore that claim 34, 35, 37-40, 45 are not anticipated by Margulis and should be allowed.

The examiner notes on Claim 36:

> As to claim 36, Margulis teaches the use of heat exchangers for cooling (see page 11 of the English language translation).

The applicant respectfully submits that there are fundamental differences between Margulis and the present invention as claimed in Claim 36:

9.6. In addition to the factors noted above that distinguish Margulis from the present invention, Margulis uses two heat exchangers. The first to *heat* the liquid and the second to convect away heat created from a possible thermonuclear reaction by neutrons penetrating a blanket. In contrast the present invention *cools* the liquid to below an ambient temperature as noted in claim 36.

The applicant submits therefore that claim 36 is not anticipated by Margulis on this factor as well. The applicant respectfully submits that this claim should therefore be allowed.

The examiner further notes on Claim 42:

> As to claim 42, applicant's claim language, "neutron source" reads on the fusion reactions in Margulis that inherently produce neutrons.

The applicant respectfully submits that there are fundamental differences between Margulis and the present invention as claimed in Claim 42:

9.7. The applicant respectfully submits that if neutrons are produced with a possible theromonuclear reaction, such neutrons are available only under positive pressure and

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therefore cannot nucleate bubbles. In contrast with the present invention where the neutrons are utilized during a tension phase of the process. Therefore Margulis does not read on the present invention on this factor as well. The applicant respectfully submits that this claim should therefore be allowed.

(Lipson et al)

10. The examiner states in support of rejection of claims 34-40,42,44 and 45:

- As to claims 34,35,37-40,44, and 45, Lipson et al., disclose a method for creating fusion reactions in media containing deuterium by cavitation. (As to the interpretation of the undefined terms in applicant's claim, the discussion above relating to Margulis applies also to Lipson et al.).

- As to the nucleating agents, Lipson et al. discloses the generation of neutrons (see page 1191, col. 2, last paragraph)

- As to tensioning of the liquid below the cavitation threshold, growth of the bubbles and their collapse, see page 1190, bottom of col. 1 and top of col. 2.

- As to claim 36, Lipson et al. disclose a cooled vessel (see page 1190, col. 2, "Experimental Apparatus and Procedure").

- As to claim 42, applicant's claim language, "neutron source" reads on the fusion reactions in Lipson et al. that inherently produce neutrons.

The applicant respectfully submits that there are fundamental differences between Lipson and the present invention as claimed in Claims 34, 35, 37-40,44 and 45:

10.1. Lipson *is enabled* by a vibrating metal projection within a liquid enriched with D, wherein the metal can absorb the D. the present invention does not require such metal protrusions and the claims noted by the examiner have no reference to such metal protrusions.

10.2. Lipson states (pp1191 last para): "It follows that assumptions 1 and 2 regarding the possible generation of neutrons during the collapse of cavitation bubbles, either directly in the D_2O or on the metal surface of the vibrator, *find no support from these results*" . (Emphasis provided) The disclosure by Lipson therefore does not support the examiner's claim.

10.3. Lipson speculates that there may be conditions for neutron emission during the growth and collapse of cavitation bubbles in D2O *enabled by* the metal surface of the protrusion or vibrator. The preset invention does not require a metal vibrator.

10.4. In Lipson the liquid with cavitation bubbles are at positive pressures and not in a tension state of the liquid as in the present invention.

10.5. Lipson uses a temperature of 30 C ±10 C and cools his apparatus to this range. The present invention may be cooled below ambient as claimed. Any scientific apparatus may be

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cooled to a required range of optimal performance. The fact that both apparatus are cooled to their respective optimal temperature ranges does not imply that the present invention reads on Lipson or for that matter any other cooled apparatus.

10.6. If Lipson results in a Fusion reaction the neutrons emitted would be available at a time *after* it has utility in creating cavitation as in the present invention.

The applicant submits therefore that claims 34-40, 42, 44 and 45 are not anticipated by Lipson. The applicant respectfully submits that this claim should therefore be allowed.

35USC 103 Rejections

11. The examiner states in support of rejection of claim 41:

> Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Margulis or Lipson et al. The size of the bubble is a parameter that depends upon specific design constraints for the system, e.g., the desired energy density of the bubbles (see page 5 of the English language translation of Margulis). Thus, it would have been obvious to modify Margulis or Lipson et al. where an application requires the claimed size of the nucleated bubbles. Such modification would have been within the knowledge and capability of one of ordinary skill in the art at the time of the claimed invention.

The applicant respectfully submits that even if it were proper to combine background art where there is no prior art teaching for their combination, no combination of Margulis and Lipson can replicate the present invention as Margulis is *enabled* with gas bubbles inserted into an unrelated liquid and Lipson is *enabled* with a metal vibrator or protrusion in the fluid, *neither of which are required for the present invention.*

Moreover, *even if these enablement requirements for Margulis and Lipson were not present*, the methods of both Lipson and Margulis use intentionally gas saturated liquids that result in foaming. Such foaming is governed by the ambient pressures that limit bubble size and simply produce more bubbles of the same size. In contrast the present invention utilizes the tensioned state of the liquid to stretch and grow the nuclear particle seeded bubbles to the required sizes. Therefore the conditions of neither Lipson nor Margulis allow for the growth of bubbles.

The applicant respectfully submits that this claim should therefore be allowed.

12. The examiner states in support of rejection of claims 43 and 46:

> Claim 43 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Margulis or Lipson et al. in view of Didenko et al. (Nature 418,7/25/02). Margulis or Lipson et al. disclose(s) the applicant's claims except for the organic liquid. Didenko et al. teach that organic liquids are advantageous for processes involving cavitation because of their very low volatility (see page 4, last full paragraph).
> Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method, as disclosed by Margulis or Lipson et al.,

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by the teaching of Didenko et al., to use organic liquids (which have high accommodation coefficients) for the cavitation liquid, to gain the advantages thereof (i.e., low volatility), because such modification is no more than the use of a well known expedient within the art.

The applicant respectfully submits that even if it were proper to combine background art where there is no prior art teaching for their combination, no combination of Margulis and Didenko or Lipson and Didenko anticipate the present invention.

12.1. Margulis is *enabled* with gas bubbles inserted into an unrelated liquid. Using an organic liquid as recommended by Didenko does not remove the enablement requirement of Margulis.

12.2. Lipson is *enabled* with a metal vibrator or protrusion in the fluid. Using an organic liquid as recommended by Didenko does not remove the enablement requirement of Lipson.

12.3. Didenko (July 2002) is preceded by the priority dates of the present application nad is therefore not an item of background art (or prior art).

The applicant respectfully submits that these claims should therefore be allowed.

13. The examiner provides a duplicate claim warning with regard to Claim 44 with regard to claim 34. The applicant thanks the examiner for the same and has revised claim 34 in the context of 44 to correct this duplication.

Conclusion

The Applicant has amended the claims as required and has provided herewith a response in support of the claims of the present invention. If for any reason this application is not found to be in full condition for allowance, applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 706.03(d) and 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

Dr. Arjuna I. Rajasingham
Chairman & Chief Executive
MMILLENNIUMM ENERGY CORPORATION

Dr. Rusi Taleyarkhan
Applicant

Att:

1. Replacement paragraphs marked up claims
2. Affidavit under 37CFR 132 – Dr. Xu
3. Affidavit under 37CFR 132 – Dr. Forringer
4. Affidavit under 37CFR 132 – Dr. Bugg
5. " Modeling Analysis and prediction of neutron emission spectra from acoustic cavitation bubble fusion experiments" Nuclear Engineering and Design 238 (20082779-2791)

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